

REMARKS

Claims 1-21 are pending. Claims 22-28 are canceled. Claim 1 is amended in part to include the Examiner's recommendation, and to replace the language "substantially free of" with "less than 5 ppm of zirconium atoms." Support for the amendments to Claim 1 can be found in the claims as originally presented as well as in the specification, for example, at page 8 lines 25-26.

35 USC § 112 Rejection

Claims 1-21 stand rejected under 35 USC § 112 as being indefinite because the phrases "substantially free of," and "incompletely oxidized reaction products comprising" are recited. See Final Office Action, p. 3. For the reasons which follow, Applicant submits that the claims as amended are definite.

Applicant adopted the Examiner's recommended amendment from "incompletely oxidized reaction products" to "incompletely oxidized reaction composition." Final Office Action, p. 5. Additionally, Applicant replaced the rejected language "substantially free of" with the numerical value of "less than 5 ppm of zirconium atoms." Applicant respectfully submits that these amendments render moot the rejection, and requests withdrawal of the 35 USC § 112 rejection of claims 1-21.

35 USC 103(a) Rejection Over Park et al. in View of Shigeyasu et al.

Claims 1-16 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al., U.S. 6,476,257 ("Park et al.") in view of Shigeyasu et al., US 4,160,108 ("Shigeyasu et al."). For the following reasons, Applicant respectfully traverses the rejection.

Claim 1 recites a process for the oxidation of p-xylene to terephthalic acid comprising oxidizing in the liquid phase a p-xylene composition in the presence of, among other things, "a catalyst composition comprising less than 5 ppm of zirconium atoms, a source of nickel (Ni) atoms, a source of manganese (Mn) atoms, and a source of bromine (Br) atoms, . . . wherein the **stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less and the amount of nickel atoms is at least 500 ppm.**" (emphasis added) Claim 1 is patentable over Park et al. in view of Shigeyasu et al. at least because neither the references, taken alone or in combination, nor the rationale set forth in the rejection of record, discloses or suggests a process for the oxidation of p-xylene to terephthalic acid in the presence of a catalyst composition comprising less than 5 ppm of zirconium atoms, a source of nickel (Ni) atoms, a source of manganese (Mn) atoms, and a source of bromine (Br) atoms, wherein the stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less and the amount of nickel atoms is at least 500 ppm.

The Examiner has mischaracterized the prior art and Applicant's arguments by stating that "the claimed ranges [of the molar ratio of bromine to manganese and the amount of nickel] do not overlap **but are close enough** that one skilled in the art would have expected them to have similar reaction conditions" Final Office Action, p. 4-5 (emphasis added). Notably, the Examiner has given no rationale as to why one skilled in the art would have expected similar results or why the ranges are "close enough." However, to support a rejection under 35 U.S.C. § 103, such rationale must be clearly set forth by the Examiner. As required by the Supreme Court, and as highlighted by the M.P.E.P.

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some

rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at ___, 82 USPQ2d at 1396.

M.P.E.P. 2141(III), Eighth Edition, Rev. 6, Sept. 2007.

Neither Park et al. nor Shigeyasu et al. teach or disclose that the molar ratio of bromine atoms to manganese atoms has any significance. The ranges for the molar ratio of bromine atoms to manganese atoms that the Examiner relies upon are not disclosed or taught in Park et al. or Shigeyasu et al. These pieces of art, alone or in combination, would not have motivated one skilled in the art to manipulate the molar ratio of bromine atoms to manganese atoms or to recite the ratio to be 1.5 or less.

In the Reply filed on January 16, 2007, p. 5-6, Applicant calculated the ranges of bromine atoms to manganese atoms based upon the example in Park et al. and the ranges of bromine and manganese concentrations disclosed in Shigeyasu et al. Park et al. and Shigeyasu et al. would not have motivated one skilled in the art to consider the molar ratio of bromine atoms to manganese atoms and make these calculations. The Examiner is not considering the prior art as a whole when he states that these ranges are close enough to Applicant's claimed ranges. In other words, the Examiner's conclusory statement regarding ranges is not based upon any ranges taught or suggested by Park et al. and Shigeyasu et al., but on Applicant's calculations. The Examiner has not articulated why one skilled in the art would have been motivated to consider the molar ratio of bromine atoms to manganese atoms let alone a claim element reciting the ratio to be 1.5 or less.

Regarding Applicant's claim element of the amount of nickel atoms is at least 500 ppm, neither Park et al. nor Shigeyasu et al. teach or disclose that the amount of nickel atoms should be a particular amount, let alone at least 500 ppm. Shigeyasu et al. disclose that a promoter of bromide with any of eighteen different metals, including nickel, may be added but such is not essential. See, e.g., Shigeyasu et al., Col. 6, lines 65-68. From the disclosure of Shigeyasu et al. that the amount of metal should be

in a given ratio to cobalt combined with the amount of cobalt, Applicant had calculated a corresponding range of amount of metal (or nickel). Reply, dated January 16, 2007, p. 6. The Examiner has used Applicant's calculation without giving any rationale why one skilled in the art would be motivated to modify the prior art such that the amount of nickel atoms is at least 500 ppm. Also, the Examiner has given no rationale for why the amount of nickel atoms disclosed in the examples of Park et al. or calculated by Applicant from Shigeyasu et al. are "close enough" to an amount of nickel atoms of at least 500 ppm. M.P.E.P. 2141(III), Eighth Edition, Rev. 6, Sept. 2007.

Rather, in the present case the Examiner merely relies on the conclusory statement that the ranges are "close enough [to the claimed ranges]. . . to expect them to have similar reaction conditions." Final Office Action, p. 4-5. No rationale is set forth in the rejection of record to support the Examiner's conclusion, and Applicant submits that none can be found in either Park et al. or Shigeyasu et al., as discussed above. The Examiner's conclusory statement that the ranges are "close enough [to the claimed ranges]. . . to expect them to have similar reaction conditions" is precisely the type of statement that is prohibited by the Federal Circuit in *In re Kahn* and the Supreme Court in *KSR*. Such conclusory statements can simply not support a rejection on obviousness.

In sum, neither Park et al. nor Shigeyasu et al., individually or in combination, discloses or suggests at least two elements of Applicant's claimed invention: a stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less and the amount of nickel atoms is at least 500 ppm. And no rationale was provided by the Examiner that would have led to the modifications suggested in the Final Office Action. Again, such rationale must be articulated by the Examiner. M.P.E.P. 2141(III), Eighth Edition, Rev. 6, Sept. 2007. Applicant respectfully notes that a prima facie case of obviousness has not been presented and requests the withdrawal of the 35 USC 103(a) rejection over Park et al. in view of Shigeyasu et al.

35 USC 103(a) Rejection Over Partenheimer et al. in View of Shigeyasu et al.

Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Partenheimer et al., US 4,786,753 ("Partenheimer et al.") in view of Shigeyasu et al., US 4,160,108 ("Shigeyasu et al."). For the following reasons, Applicant respectfully traverses the rejection.

Claim 1 recites a process for the oxidation of p-xylene to terephthalic acid comprising oxidizing in the liquid phase a p-xylene composition in the presence of, among other things, "a catalyst composition comprising **less than 5 ppm of zirconium atoms**, a source of nickel (Ni) atoms, a source of manganese (Mn) atoms, and a source of bromine (Br) atoms, . . . wherein the **stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less** and the amount of nickel atoms is at least 500 ppm." (emphasis added) Claim 1 is patentable over Partenheimer et al. in view of Shigeyasu et al. at least because neither the references, taken alone or in combination, nor the rationale set forth in the rejection of record, discloses or suggests a process for the oxidation of p-xylene to terephthalic acid in the presence of a catalyst composition comprising less than 5 ppm of zirconium atoms, a source of nickel (Ni) atoms, a source of manganese (Mn) atoms, and a source of bromine (Br) atoms, wherein the stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less.

As argued above, the Examiner has mischaracterized the prior art and Applicant's arguments by stating that "the claimed ranges [of the molar ratio of bromine to manganese] do not overlap but are close enough that one skilled in the art would have expected them to have similar reaction conditions" Final Office Action, p. 4-5. The Examiner has given no rationale as to why one skilled in the art would have expected similar results or why the ranges are "close enough." However, to support a rejection under 35 U.S.C. § 103, such rationale must be clearly set forth by the Examiner. M.P.E.P. 2141(III), Eighth Edition, Rev. 6, Sept., 2007.

Furthermore, neither Partenheimer et al. nor Shigeyasu et al. teach or disclose that the molar ratio of bromine atoms to manganese atoms has any significance. The ranges for the molar ratio of bromine atoms to manganese atoms that the Examiner relies upon, are not disclosed or taught in Partenheimer et al. or Shigeyasu et al. These pieces of art, alone or in combination, would not have motivated one skilled in the art to manipulate the molar ratio of bromine atoms to manganese atoms to be 1.5 or less.

In the Reply filed on January 16, 2007, p. 6, 9, Applicant calculated the ranges of bromine atoms to manganese atoms based upon ratio ranges of total metals to bromine combined with ratio ranges among individual metals in Partenheimer et al. and the ranges of bromine and manganese concentrations disclosed in Shigeyasu et al. Partenheimer et al. and Shigeyasu et al. would not have motivated one skilled in the art to consider the molar ratio of bromine atoms to manganese atoms and make these calculations. The Examiner is not considering the prior art as a whole when he states that these ranges are close enough to Applicant's claimed ranges. In other words, the Examiner's conclusory statement regarding ranges is not based upon any ranges taught or suggested by Partenheimer et al. and Shigeyasu et al., but on Applicant's calculations. The Examiner has not articulated why one skilled in the art would have been motivated to consider the molar ratio of bromine atoms to manganese atoms let alone a claim element reciting the ratio to be 1.5 or less.

Regarding the presence of zirconium atoms in the presently claimed catalyst composition, the Examiner relies on Partenheimer et al. Table II (Partenheimer et. al. Col. 5, lines 14-38).

From this table, it seems reasonable to assume that Partenheimer et al. does suggest that the reaction process can be conducted either [sic] the catalyst system substantially free of zirconium or the catalyst system completely free of zirconium as disclosed in examples 15-18; furthermore, Partenheimer et al. expressly supports the claimed concept in view of the oxidation rate being increased in the catalyst system completely free of zirconium.

Final Office Action, p. 6.

The Examiner has not properly characterized the scope and content of Partenheimer et al. "Addition of **nickel and zirconium** to oxidation catalysis provided by heavy, transition metal-bromine ion combination containing at least manganese ion **uniquely increases catalytic activity.**" Partenheimer et al., Col. 1, lines 7-10 (emphasis added). Only one of eight data points in Table II (Example 17 at 0.3% H₂O) shows a higher oxidation rate for the zirconium free catalyst system as compared to the examples with zirconium. Partenheimer et al. do not expressly support Applicant's Claim 1 as alleged by the Examiner, but rather expressly state that "[t]he **synergistic effect of zirconium** on Ni/Mn/Br catalyst was observed" in the examples of Tables I and II. Partenheimer et al., Col. 4, lines 48-50 (emphasis added). In the Final Office Action on page 7, the Examiner quotes a section of Partenheimer et al. as follows: "[t]he source of molecular oxygen for the **nickel and zirconium enhanced oxidation of this invention** can vary in O₂ content from that of air to oxygen gas." Partenheimer et al., Col. 2, lines 34-36 (emphasis added).

The only teaching relied upon in an attempt to support this obviousness rejection is a *comparative* example, and the only teaching within Partenheimer et al. suggesting a modification of a comparative example to improve the oxidation rate is to **employ** zirconium atoms. The fact that Example 17 is a comparative example is powerful evidence pointing away from and teaching against the use of a catalyst composition comprising, among other things, less than 5 ppm of zirconium atoms. Partenheimer et al. simply do not provide any teaching whatsoever on how to modify that catalyst composition in a manner other than by addition of zirconium atoms. Examiner has not presented articulated reasoning as to why one skilled in the art would have been motivated to modify Partenheimer et al. to obtain a catalyst composition comprising less than 5 ppm of zirconium atoms. M.P.E.P. 2141(III), Eighth Edition, rev. 6, Sept. 2007. Shigeyasu et al. is silent with regard to zirconium.

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Amendment dated November 30, 2007
Reply to Office action dated April 17, 2007

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In sum, neither Partenheimer et al. nor Shigeyasu et al., individually or in combination, discloses or suggests at least two elements of Applicant's claimed invention. Neither reference discloses or suggests a process for the oxidation of p-xylene to terephthalic acid comprising oxidizing in the liquid phase a p-xylene composition in the presence of, among other things, "a catalyst composition comprising less than 5 ppm of zirconium atoms, a source of nickel (Ni) atoms, a source of manganese (Mn) atoms, and a source of bromine (Br) atoms, . . . wherein the stoichiometric molar ratio of bromine atoms to manganese atoms is 1.5 or less" as recited in claim 1. And no rationale was provided by the Examiner that would have led to the modifications suggested in the Final Office Action. Again, such rationale must be articulated by the Examiner. M.P.E.P. 2141(III), Eighth Edition, Rev. 6, Sept. 2007. Applicant respectfully notes that a prima facie case of obviousness has not been presented. Applicant requests that the 135 USC 103(a) rejection over Partenheimer et al. in view of Shigeyasu et al. be withdrawn.

In summary, Applicant believes the application to be in condition for allowance. Accordingly, the Examiner is respectfully requested to reconsider the rejection(s), enter the above amendment, remove all rejections, and pass the application to issuance.

Respectfully submitted,

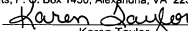
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